

# **VAMP Arc Flash Protection**

## **Testing Manual**

**Publication version VARCTEST/EN M/B002**



# Legal notice

## Copyright

© Schneider Electric 2012. All rights reserved.

## Disclaimer

No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this document. This document is not intended as an instruction manual for untrained persons. This document gives instructions on device installation, commissioning and operation. However, the manual cannot cover all conceivable circumstances or include detailed information on all topics. In the event of questions or specific problems, do not take any action without proper authorization. Contact Schneider Electric and request the necessary information.

## Contact information

35 rue Joseph Monier  
92506 Rueil-Malmaison  
FRANCE  
Phone: +33 (0) 1 41 29 70 00  
Fax: +33 (0) 1 41 29 71 00  
[www.schneider-electric.com](http://www.schneider-electric.com)

# Safety information

## **DANGER**

- Failure to follow these instructions will result in death or serious injury.

## **WARNING**

- Only qualified personnel should install this equipment. Such work should be performed only after reading this entire set of instructions.
- Turn off all power supplying this equipment before starting the installation work.
- Ensure the protective grounding is connected.
- Before performing visual inspections, commissioning, or maintenance on this equipment, disconnect all sources of electric power.
- Assume that all circuits are live until they have been completely de-energised, tested and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Beware of potential hazards, wear personal protective equipment, carefully inspect the work area for tools and objects that may have been used during commissioning or maintenance.
- Neglecting fundamental installation requirements can lead to personal injury as well as damage to electrical equipment or other property.
- Handling this equipment requires relevant expertise in the field of protection of electrical networks. Only competent people who have this expertise are allowed to configure and set up this product.

## **CAUTION**

- Before performing dielectric (Hi-Pot) testing on any equipment in which the IED is installed, disconnect all input and output wires to the IED. High voltage testing can damage electronic components contained in the unit.

### **NOTICE**

- Always use a properly rated voltage sensing device to confirm that all power is off.
- The successful operation of this equipment depends upon proper handling, installation, and operation.

**Table of Contents**

<b>Legal notice</b>	<b>3</b>
<b>Safety information</b>	<b>4</b>
<b>1. This document</b>	<b>8</b>
1.1. Purpose	8
1.2. Related documents	8
1.3. Symbols	8
<b>2. Preparations for the testing</b>	<b>9</b>
2.1. Required documentation	9
2.2. Required equipment	9
2.4. System inspection	10
2.5. Safety precautions	11
<b>3. Commissioning testing</b>	<b>12</b>
3.1. Commissioning testing sequence	12
3.3. Checking I/O unit addresses	13
3.4. Checking zones	13
3.5. Disconnecting trip circuits	13
3.6. Testing of arc flash sensors	14
3.6.1. Testing point or fibre sensors	15
3.6.2. Testing portable sensors	16
3.6.3. Testing of the supervision of arc flash sensors	17
3.6.4. Testing the supervision of I/O units	18
3.7. Connections for testing devices	19
3.7.1. Connecting a current injection device without the time measurement	19
3.7.2. Connecting a current injection device for the time measurement	20
3.8. Testing the BI/O channel	21
3.9. Testing alarm contacts	21
3.10. Testing the arc flash protection with the overcurrent condition	22
3.10.1. Testing the pickup value	22
3.10.2. Testing without the time measurement	22
3.10.4. Testing with the time measurement	23
3.10.5. Testing protection zones	23
3.10.6. Testing the circuit-breaker failure protection	24
3.11. Testing the selectivity of the arc flash protection	25
3.12. Restoring the system	25
<b>4. Test report</b>	<b>26</b>
4.1. Filling in the test report	26
4.2. Test report example	27
<b>5. Troubleshooting</b>	<b>30</b>
5.1. Checking the wiring	30
5.2. Checking the trip condition	30
5.3. Checking the I/O unit and arc flash sensor installation	30
5.4. Checking the suitability of the light source	30
5.6. Checking the daylight blocking mode	31

6. Glossary .....32

# 1. This document

## 1.1. Purpose

This document contains instructions on the secondary commissioning test procedure of the VAMP arc flash protection systems VAMP 321 and VAMP 221 as well as VAMP 121 and 120 units. This guide also contains troubleshooting information.

The prerequisite for the testing procedure described in this manual is that the system to be tested is installed and configured.

## 1.2. Related documents





Document	Identification <sup>*)</sup>
VAMP Mounting and Commissioning Instructions	VARCMC/EN M/xxxx
VAMPSET Setting and Configuration Tool User Manual	VVAMPSET/EN M/xxxx
VAMP 120 Arc protection unit user manual	V120/EN M/xxxx
VAMP 121 Arc protection unit user manual	V121/EN M/xxxx
VAMP 221 Arc protection system Operation and configuration instructions/ Technical descriptions	V221/EN M/xxxx

<sup>\*)</sup> xxxx = one document revision index and a three-digit document version number

NOTE!

Download the latest documents and software at [www.schneider-electric.com](http://www.schneider-electric.com).

## 1.3. Symbols

Symbol	Description
	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
	Addresses practices not related to personal injury.



## 2. Preparations for the testing

### 2.1. Required documentation

During the testing the test results and remarks are documented in a test report. The test report should clearly indicate what tests have been performed and what the respective test results are.

In addition to the test report, the customer may also request other documentation not specified in this manual.

- Risk assessment
- Method statement
- Commissioning program
- List of the equipment to be used during the testing

### 2.2. Required equipment

Special tools and protective clothing are required during the testing.

- Current injection device
  - One phase (for example Sverker 750/760)
  - Three phase with time measurement is recommended (for example Freja 300)
- Powerful light source
  - Flashlight (burning time >5ms, non LED)
  - Flashlight with an output contact for time measurement (burning time >5ms, non LED)
  - Torch (MagLite)
  - Recommended flash device: Nissin Digital, Di622 Mark II / Canon, Speedlite 430EX II or equivalent.
- Screwdriver kit
- Test leads
- Extension cord
- Multimeter
- Relay tester
- Arc flash resistive clothing including helmet, protective goggles and gloves

## 2.4. System inspection

Before the actual testing begins, the station and the system to be tested should be inspected. The aim is to find out the relevant details of the system to be able to choose a suitable testing procedure. The inspection consists of different procedures.

- Consulting the customer about the details of the system as good communication and mutual understanding is a prerequisite for successful testing.
- Defining the boundaries of the safe and hazardous working areas and checking that they are properly marked.
- Inspecting the devices and wiring visually.
- Checking the application; comparing the actual system to the available system drawings and also checking that the system and application are logical.
- Checking that the used settings correspond to the system plans and further, checking any anomalies in the settings, like a deviation from the planned value, with the customer.
- Based on the details of the system, defining the proper testing procedure.
- Checking device code and location map; comparing the device and location codes with the available system drawings and documenting the deviations in the test report.

## 2.5. Safety precautions

The required level of safety for the system to be tested should always be defined before the testing can begin. Also, the safety procedures need to be verified with the customer. Note that the safety regulations and procedures vary significantly, for example, depending on the country or the application area but certain points need to be considered.

- What is the level of testing? What part of the station is de-energised?
- Has the system been de-energised if the light sensors are installed near the busbar?
- Should auxiliary power be fed to the protection units?
- What is the level of lightning?

### NOTICE

Testing the arc flash sensors using a light source can trip the neighboring zones.



### WARNING

Working near live components is dangerous. Be careful when testing in the vicinity of live circuits.

## 3. Commissioning testing

### 3.1. Commissioning testing sequence

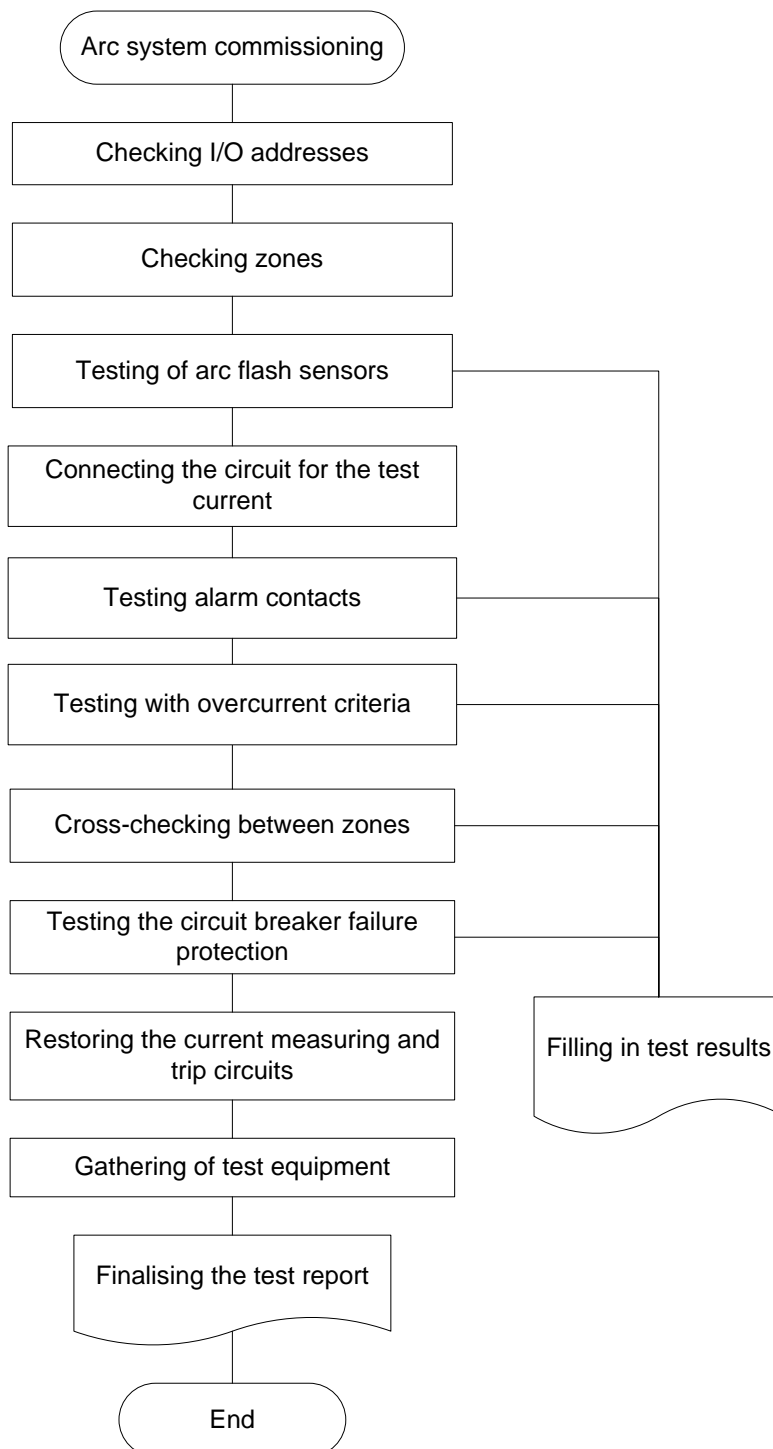


Figure 3.1-1 Test sequence

### 3.3. Checking I/O unit addresses

1. Check the settings of the main unit and verify how many I/O units and sensors are configured.
2. Compare the settings with the actual number of installed I/O units and sensors in the system.
3. Compare the settings with the drawings.

NOTE! See the user manual for information on how to check the settings.

### 3.4. Checking zones

1. Check the protected zones and compare them against the drawings.
2. Study the system and find out if a part of the system needs to be disconnected before the test.
3. Consult the customer if the configuration does not match with the drawings.

### 3.5. Disconnecting trip circuits

Disconnect the trip signals to the circuit breakers that may disturb other parts of the system during the test. Disconnect also trip signals routed to other parts of the system, such as the CBFP backup trip to upstream breakers and the transfer trip signals. Test the disconnected trip signals with a multimeter.

## 3.6. Testing of arc flash sensors

Testing the arc flash sensors with the light only criteria operates the trip outputs of the main unit or I/O units for the protected zone. Testing the arc flash sensors with the light and current criteria, without an injected current, only generates an indication on the unit that protects the zone. The indication of the fault is registered by the possible main unit and I/O unit.

**NOTE!** For more information on viewing indications, see the user manual.

Three different arc flash sensors are available to be used with the VAMP arc flash protection systems.

Sensor	Type
Arc point sensors	VA1DA-x VA1EH-x
Arc fibre sensor	Arc-SLmx
Arc portable sensors	VA1DP-5 VA1DP-5D

### 3.6.1. Testing point or fibre sensors

#### 4) Testing the point sensor

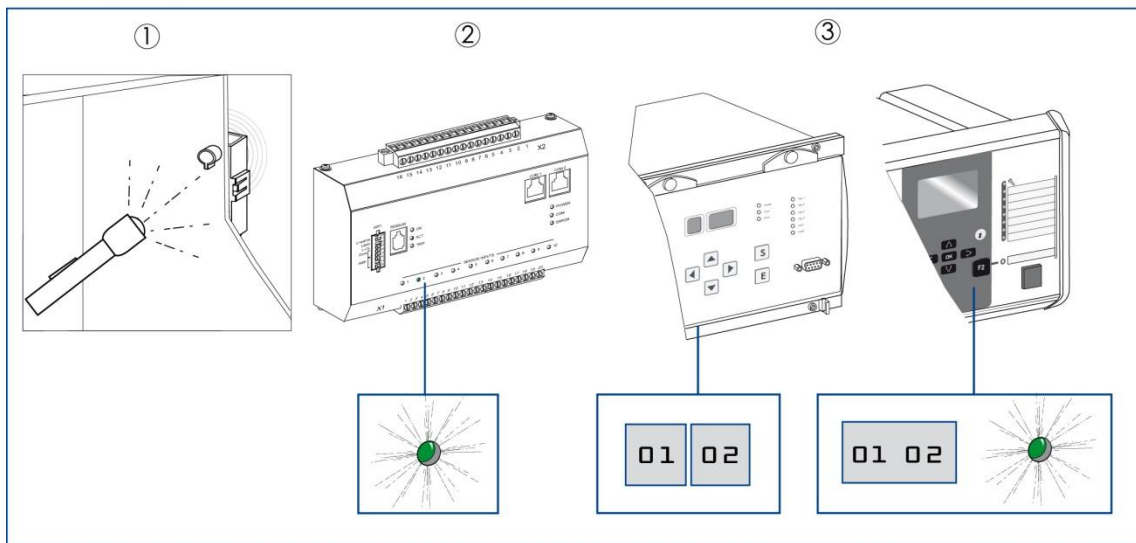


Figure 3.6.1-1 Testing point sensors

#### 5) Testing the fibre sensor

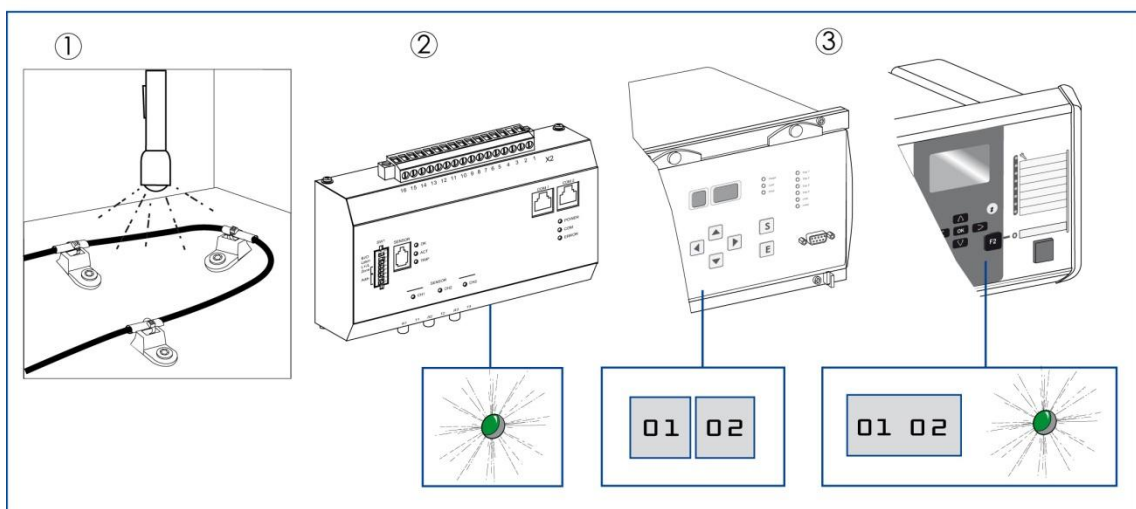


Figure 3.6.1-2 Testing fibre sensors

#### NOTICE

Reset the main unit before the test.

1. Point light to each arc flash sensor, one at a time, until activated with a powerful light source such as a flashlight or torch.
2. Check the light sensor indication from the unit.
3. Check the light sensor address from the main unit.

In case of stand alone units VAMP 120 and VAMP 121, check the light sensor address from the channel number beside the sensor indication LED.

4. Compare the light sensor address information from the main unit with the sensor location map.
5. Fill in the test result in the test report.
6. Reset the main unit.
7. Repeat the procedure with the next point or fibre sensor.

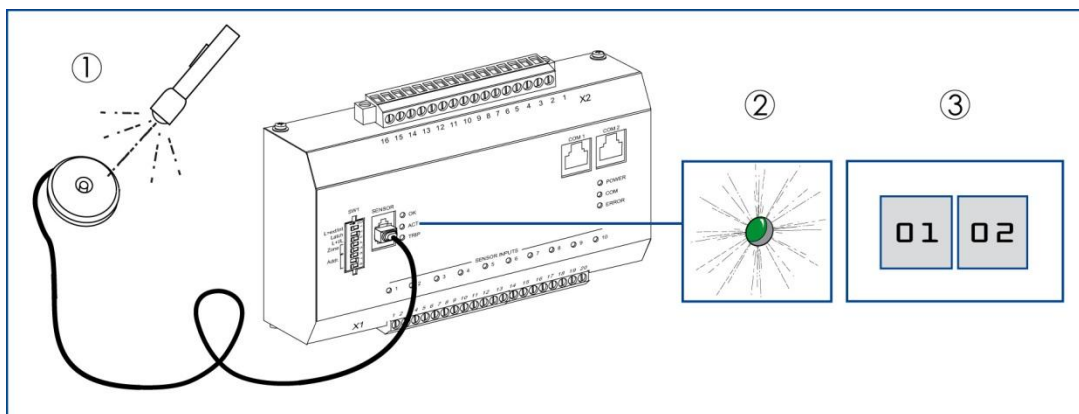
## NOTICE

For more information on viewing and resetting indications, see the user manual.

## NOTICE

Due to their placement, some sensors may not be tested without dismantling parts of the system. Either dismantle the necessary parts of the system to run the test or pass the test. Document the choice in the test report.

### 3.6.2. Testing portable sensors



*Figure 3.6.2-1 Testing portable sensors*

**NOTE!** Reset the main unit before the test.

1. Connect the portable arc flash sensor to the I/O unit and test it. Provide light to the sensor with a powerful light source such as a flashlight or torch.

Be sure to connect to an I/O unit that is protecting the area where the work is ongoing. Some units may only trip the circuit breaker of the outgoing feeder.

2. Check the light sensor indication from the unit.
3. Check the light sensor address from the main unit.
4. Fill in the test result in the test report.
5. Reset the main unit.
6. Repeat the procedure with the next I/O unit.

## NOTICE

For more information on viewing and resetting indications, see the user manual.

## NOTICE

To avoid false activations, disconnect the portable sensor from the unit immediately after use.



### 3.6.3. Testing of the supervision of arc flash sensors

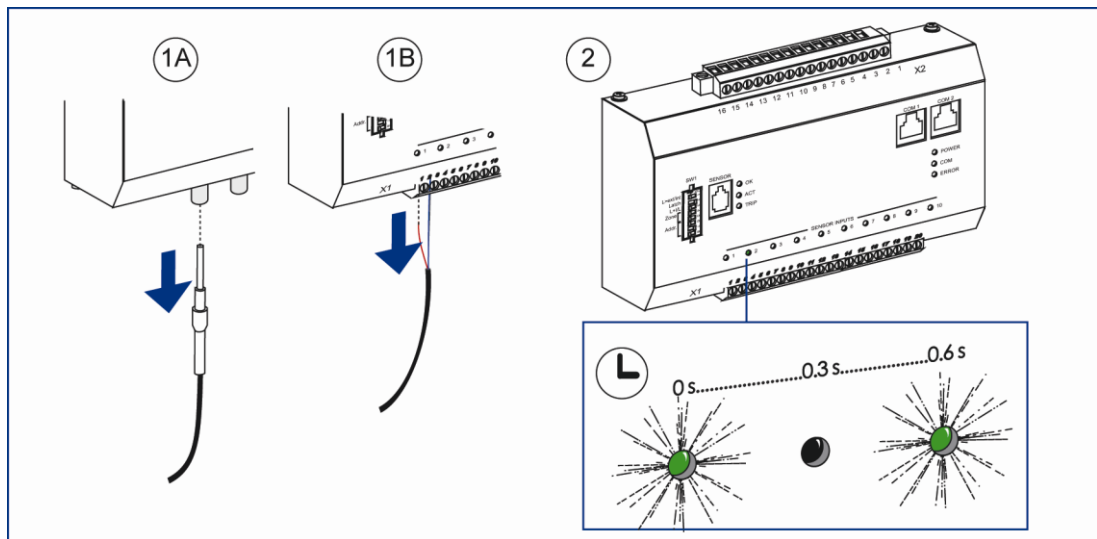


Figure 3.6.3-1 Testing the self-supervision of sensors

#### Testing the supervision of point sensors

1. Disconnect one wire from one point sensor, one for each unit, to see that the self-supervision system recognises the fault in the sensor.
2. Wait until the fault indication appears.

Depending on the device this can take several minutes.

3. Check that the internal fault relay operates and that the self-supervision information travels to the possible external systems.
4. Fill in the test results in the test report.
5. Reconnect the wire and reset the system.
6. Repeat the procedure with the any other units.

#### Testing the supervision of fibre sensors

1. Disconnect one end of the fibre sensor, one for each unit, to see that the self-supervision system recognises the fault in the sensor.
2. Wait until the fault indication appears.

Depending on the device this can take several minutes.

3. Check that the internal fault relay operates and that self-supervision information travels to the possible external systems.
4. Fill in the test results in the test report.
5. Reconnect the arc fibre sensor and reset the system.
6. Repeat the procedure with the any other I/O units.

### 3.6.4. Testing the supervision of I/O units

#### 3) Testing the selfsupervision of the units

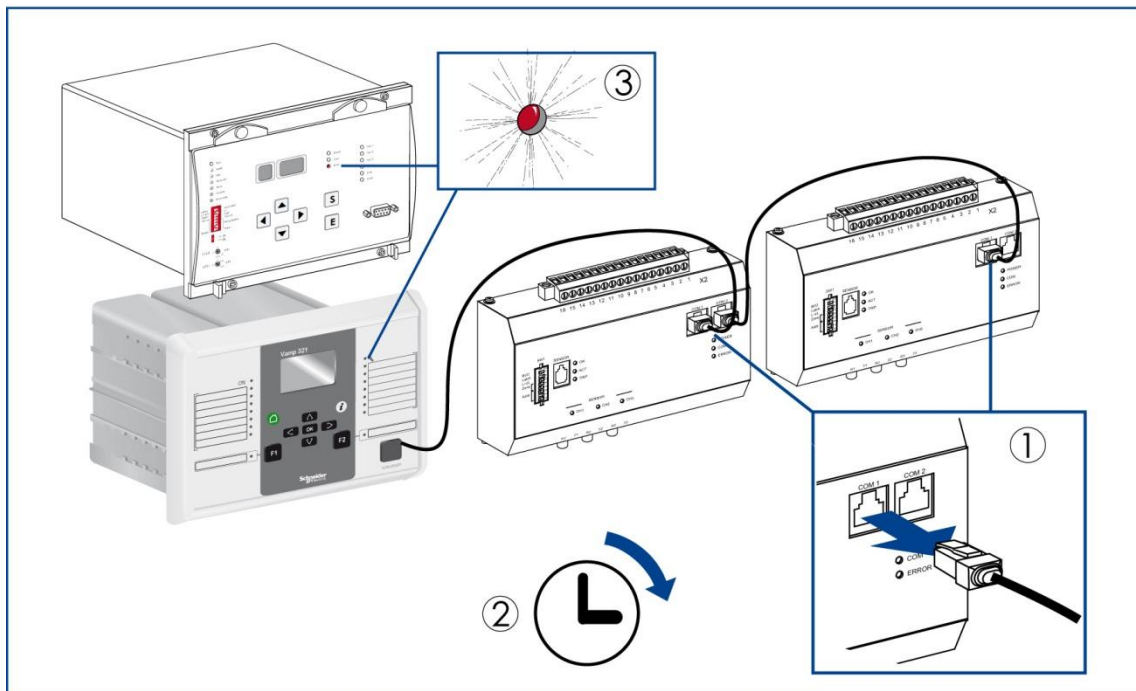


Figure 3.6.4-1 Testing of the I/O units self-supervision

1. Disconnect the modular cable from one I/O unit.
2. Wait until the fault indication appears on the main unit. Depending on the device this can take several minutes.
3. Check that the internal fault relay in the main unit operates and that the self-supervision information travels to the possible external systems.
4. Fill in the test results in the test report.
5. Reconnect the modular cable.

#### NOTICE

For the VAMP 321 unit the self-supervision has to be configured.

#### NOTICE

For more information on self-supervision, see the user manual.

## 3.7. Connections for testing devices

The current measuring circuit always has to remain intact.



### **WARNING**

Do not open a loaded current measuring circuit before the secondary circuit of the current transformer is reliably short-circuited. An open secondary circuit in the current transformer may destroy the current transformer.

### 3.7.1. Connecting a current injection device without the time measurement

1. Short circuit the secondary circuit of the current transformer and disconnect the main unit or I/O unit from the measuring circuit.
2. Connect a current injection device, one phase at a time, to the main or current measuring I/O units current measuring circuit.

### 3.7.2. Connecting a current injection device for the time measurement

6) Time measurement

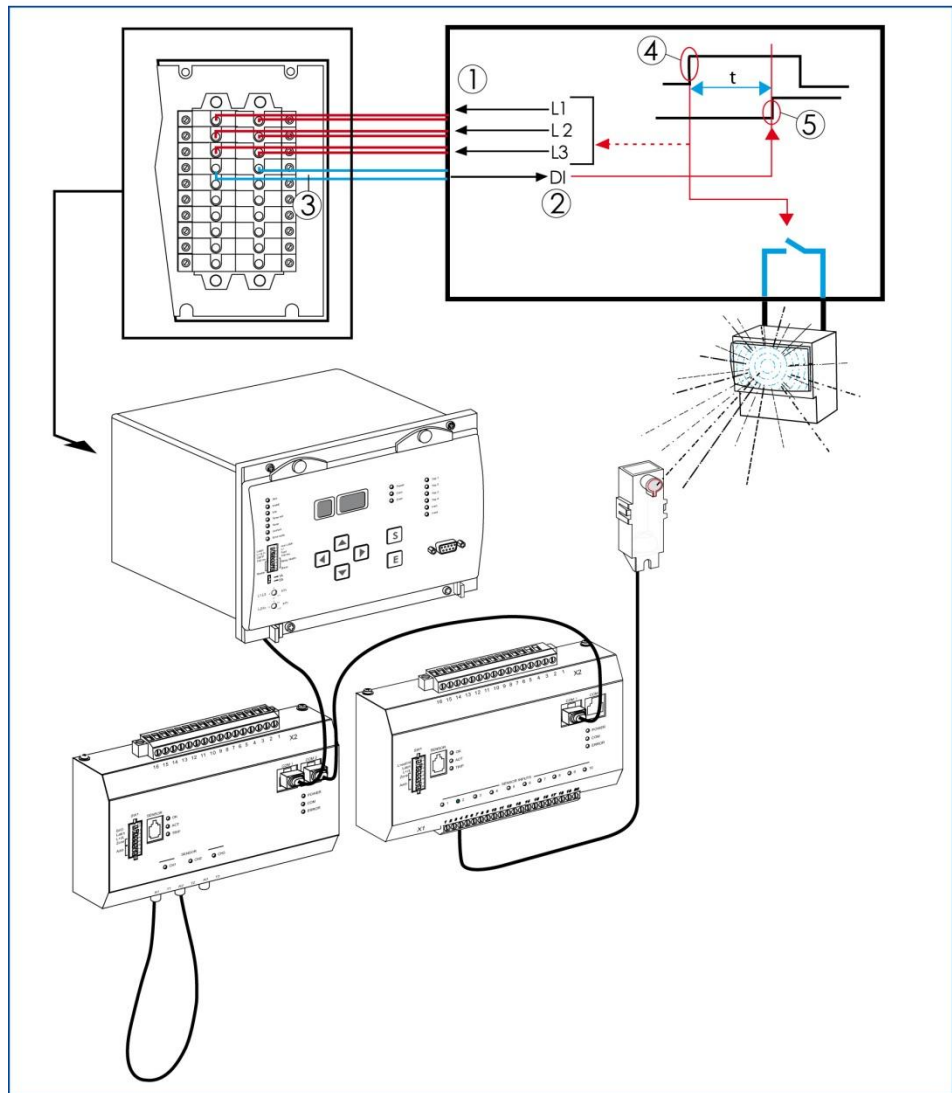


Figure 3.7.2-1 Connecting injection device for the time measurement

1. Short circuit the secondary circuit of the current transformer and disconnect the main unit or I/O unit from the measuring circuit.
2. Connect a three-phase current injection device with time measurement to the main or current measuring I/O units of the current measuring circuit.

Connect the injection device either to inject the current continuously or to be triggered by the time measuring circuit.

3. Use the digital input of the current injection device for the stop trigger in the time measurement circuit.
4. Connect the trip output of the tested unit to the digital input of the current injection device for the stop trigger. For measuring the total operating time, use the circuit breaker's

NO contact, which indicates that status of circuit breaker is open, for the stop trigger.

5. Connect the time measuring start signal output to the flashlight. Configure the time measuring start signal to either trigger only the flashlight or both the flashlight and the current injection.

Preferably, the current injection should be triggered before the flashlight.

6. Measure the operate time between the start trigger and stop trigger.

## 3.8. Testing the BI/O channel

BI/O signals such as light and overcurrent information are transmitted between units via a BI/O bus.

1. Activate the signal outputs in the BI/O bus for the sending unit by generating arc fault light signal, overcurrent pickup or both.
2. Check the sent signal from the receiving unit to verify that the function operates according to the configuration.
3. Fill in the test result in the test report.
4. Reset the main unit.

## 3.9. Testing alarm contacts

Alarm signals generated by the arc protection system (trip and self-supervision alarms) can be forwarded to higher-level switchgear supervision and control systems through the output contacts.

1. Activate an alarm by generating an arc fault trip or self-supervision alarm.
2. Check the alarm contact operation from the higher-level system. For VAMP 321, alarm signals can also be sent via communication.
3. Fill in the test result in the test report.
4. Reset the main unit.
5. Repeat the procedure with the next alarm contact.

## 3.10. Testing the arc flash protection with the overcurrent condition

### 3.10.1. Testing the pickup value

1. Check the pickup value settings of the current criteria by injecting a current to the main or I/O unit.
2. Increase the current until the overcurrent criterion picks up.
3. Fill in the test results in the test report.
4. Reset the main unit.
5. Compare the current settings with the drawings.
6. If needed, connect the current injection device to another unit in the protected zone and repeat the test.

#### **NOTICE**

For more information on viewing and resetting indications, see the user manual.

### 3.10.2. Testing without the time measurement

1. Inject a current, two times greater than the set current level, to the unit that protects the zone. Inject a current in each phase, one phase at a time, for every current measuring main unit or I/O unit.

Check that the technical characteristics of the channels are not exceeded.

2. While injecting the current, point light with a flashlight to at least one of the arc flash sensors, one at a time.
3. Check that the function operates.
4. Generate at least one trip with current per I/O unit.
5. Fill in the test result in the test report.
6. Reset the main unit.
7. If needed, connect the current injection device to another unit in the system and repeat the test.

#### **NOTICE**

For more information on viewing and resetting indications, see the user manual.

### 3.10.4. Testing with the time measurement

1. Inject current, two times greater than the set current level, to the unit that protects the zone. Inject current to all three phases for every current measuring main unit or I/O unit. The current can be injected in two ways.

- Continuous injection
- Injection triggered by the time measurement start

Check that the technical characteristics of the channels are not exceeded.

2. Point the flashlight and start the time measurement to trigger it. Point light to at least one of the arc flash sensors, one at a time.
3. Check that the function operates.
4. Check the operate time from the time measuring device.
5. Generate at least one trip with current per I/O unit.
6. Fill in the test result in the test report.
7. Reset the main unit.
8. If needed, connect the current injection device to another unit in the system and repeat the test.

#### **NOTICE**

For more information on viewing and resetting indications, see the user manual.

### 3.10.5. Testing protection zones

#### **Checking the operation within the same zone**

1. Test the protection zones, one at a time, by applying signals to operate the arc flash protection within the zone according to the plans.
2. Check that the function operates.
3. Compare the result with the plans.
4. Fill in the test result in the test report.
5. Repeat the procedure with the other zones.

#### **NOTICE**

Minimise the need to move the test equipment by cross-checking the operation between different zones in parallel with this test.

#### Cross-checking the operation between different zones

1. Test the protection zones, one at a time, by applying signals to operate the arc flash protection in other protection zones according to the plans.
2. Check that the other protection zones do not cause unwanted operations in the zone being tested.
3. Check that the function operates according to the plans.
4. Fill in the test result in the test report.
5. Repeat the procedure with the other zones.

### 3.10.6.

#### Testing the circuit-breaker failure protection

1. Inject a current above the overcurrent setting value to the main unit or to one of the current measuring I/O units.
2. Point light to one of the light sensors in the protected zone with a bright torch.

The light pulse has to be longer than the CBFP time setting. Thus, the light pulse from a flashlight is too short.

3. Check that the CBFP function operates.
4. Fill in the test result in the test report.
5. Reset the main unit.
6. If needed connect the current injection device to another unit in the protected zone and repeat the test.

#### **NOTICE**

For more information on viewing and resetting indications, see the user manual.

#### **NOTICE**

Use a torch to test the CBFP, because the light pulse from a flashlight is too short.

#### **NOTICE**

Ensure that the light pulse is not too long. If the light pulse is longer than 3 seconds, the daylight blocking function generates an alarm.



## 3.11. Testing the selectivity of the arc flash protection

1. Test the selectivity of the protection zones, one at a time, by pointing light to an arc flash sensor in a protection zone.
2. Compare the operation against the plans.
3. Inject current to the tested zone.
4. Compare the operation against the plans.
5. Inject current and at the same time point light to one arc flash sensor in the tested zone.
6. Compare the operation against the plans.
7. Fill in the test result in the test report.
8. Repeat the procedure with the other zones.

## 3.12. Restoring the system

1. Disconnect the current injection device from the current circuit and restore the wiring for the current measuring circuit to the pre-test conditions.
2. Open the short circuit for the current measurement transformer.
3. Reconnect the opened trip circuits.
4. Ensure that there are no active warnings or errors on the units.
5. Reset the system to clear the events from the tests.
6. Gather all the test equipment and devices.

### **NOTICE**

Ensure that no equipment used during the test is left behind.

## **4. Test report**

### **4.1. Filling in the test report**

Download the test report template from the Schneider Electric Web site. Fill in all the required information about the system, the tested arc flash units and the test results.

See the example test report with the VAMP 221 arc protection system.

## 4.2. Test report example

Client _____ Project _____	<b>Main unit test report</b> Page / pages _____																		
Device code: - K40 Location: SS05-J12 Type: VAMP221 Serial number: _____																			
Uaux: <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/> Ac</td> <td style="text-align: center;"><input type="checkbox"/> Dc</td> </tr> <tr> <td style="height: 20px;"></td> <td style="height: 20px;"></td> </tr> </table>	<input checked="" type="checkbox"/> Ac	<input type="checkbox"/> Dc			CT ratio: <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">Primary</td> <td style="text-align: center;">Secondary</td> </tr> <tr> <td style="height: 20px;"></td> <td style="text-align: center;"><input checked="" type="checkbox"/> 1 A    <input type="checkbox"/> 5 A</td> </tr> </table>	Primary	Secondary		<input checked="" type="checkbox"/> 1 A <input type="checkbox"/> 5 A										
<input checked="" type="checkbox"/> Ac	<input type="checkbox"/> Dc																		
Primary	Secondary																		
	<input checked="" type="checkbox"/> 1 A <input type="checkbox"/> 5 A																		
Does the unit receive BI/O - message from other unit: <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">Current</td> <td style="text-align: center;">Light</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/> Yes    <input type="checkbox"/> No</td> <td style="text-align: center;"><input checked="" type="checkbox"/> Yes    <input type="checkbox"/> No</td> </tr> </table>		Current	Light	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No														
Current	Light																		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No																		
<b>RELAY SETTINGS</b>  IL1, IL3 I> ( x In ): _____  IL2/Io I> ( x In ): _____  <b>Switch group settings</b>  <table style="width: 100%;"> <thead> <tr> <th style="width: 50%; text-align: center;">Off</th> <th style="width: 50%; text-align: center;">On</th> </tr> </thead> <tbody> <tr> <td>1 <input type="checkbox"/> Latch</td> <td><input checked="" type="checkbox"/> No latch</td> </tr> <tr> <td>2 <input checked="" type="checkbox"/> I&gt; &amp; I&gt;</td> <td><input checked="" type="checkbox"/> I&gt;</td> </tr> <tr> <td>3 <input checked="" type="checkbox"/> CBFP</td> <td><input type="checkbox"/> Fast</td> </tr> <tr> <td>4 <input type="checkbox"/> 100 ms</td> <td><input type="checkbox"/> 150 ms</td> </tr> <tr> <td>5 <input type="checkbox"/> Matrix</td> <td><input checked="" type="checkbox"/> Matrix</td> </tr> <tr> <td>6 <input checked="" type="checkbox"/> Matrix</td> <td><input checked="" type="checkbox"/> Matrix</td> </tr> <tr> <td>7 <input checked="" type="checkbox"/> Matrix</td> <td><input checked="" type="checkbox"/> Matrix</td> </tr> <tr> <td>8 <input type="checkbox"/> Master</td> <td><input checked="" type="checkbox"/> Slave</td> </tr> </tbody> </table>	Off	On	1 <input type="checkbox"/> Latch	<input checked="" type="checkbox"/> No latch	2 <input checked="" type="checkbox"/> I> & I>	<input checked="" type="checkbox"/> I>	3 <input checked="" type="checkbox"/> CBFP	<input type="checkbox"/> Fast	4 <input type="checkbox"/> 100 ms	<input type="checkbox"/> 150 ms	5 <input type="checkbox"/> Matrix	<input checked="" type="checkbox"/> Matrix	6 <input checked="" type="checkbox"/> Matrix	<input checked="" type="checkbox"/> Matrix	7 <input checked="" type="checkbox"/> Matrix	<input checked="" type="checkbox"/> Matrix	8 <input type="checkbox"/> Master	<input checked="" type="checkbox"/> Slave	<b>TEST VALUES</b>  Pick-up current IL1: _____  Pick-up current IL2/Io: _____  Pick-up current IL3: _____  <b>OPERATING TIME</b>  Injected current: _____ (2x I>, in all three phases)  Measured time: _____
Off	On																		
1 <input type="checkbox"/> Latch	<input checked="" type="checkbox"/> No latch																		
2 <input checked="" type="checkbox"/> I> & I>	<input checked="" type="checkbox"/> I>																		
3 <input checked="" type="checkbox"/> CBFP	<input type="checkbox"/> Fast																		
4 <input type="checkbox"/> 100 ms	<input type="checkbox"/> 150 ms																		
5 <input type="checkbox"/> Matrix	<input checked="" type="checkbox"/> Matrix																		
6 <input checked="" type="checkbox"/> Matrix	<input checked="" type="checkbox"/> Matrix																		
7 <input checked="" type="checkbox"/> Matrix	<input checked="" type="checkbox"/> Matrix																		
8 <input type="checkbox"/> Master	<input checked="" type="checkbox"/> Slave																		
<b>FUNCTIONAL TEST</b> DONE: <input checked="" type="checkbox"/> Trips <input checked="" type="checkbox"/> Alarms <input type="checkbox"/> Indication <input type="checkbox"/> BI/O <input type="checkbox"/> Self-supervision  OK: <input checked="" type="checkbox"/> Trips <input checked="" type="checkbox"/> Alarms <input type="checkbox"/> Indication <input type="checkbox"/> BI/O <input type="checkbox"/> Self-supervision																			
<b>Remarks</b>																			
<b>Test equipment</b>  Type: _____    S/N: _____    Calibration date: _____																			
Tested by: _____    Date: _____ <div style="display: flex; justify-content: space-between;"> <span>Your name</span> <span>dd.mm.yyyy</span> </div>																			

Figure 4.2-1 Test report example page 1

Figure 4.2-2 Test report example page 2

Client _____ Project _____		<b>Current I/O unit test report</b> Page/pages 1 / x																																								
Device code: K41 Location: SS05-J02 Type: VAM 4C Serial number: _____																																										
Uaux: <table border="1" style="display: inline-table; margin-left: 10px;"> <tr> <td style="padding: 2px;">Modular cable</td> <td style="padding: 2px;">Terminal X2: 1-2</td> </tr> <tr> <td style="text-align: center; padding: 2px;"><input checked="" type="checkbox"/></td> <td style="text-align: center; padding: 2px;"><input type="checkbox"/></td> </tr> </table>		Modular cable	Terminal X2: 1-2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CT ratio: <table border="1" style="display: inline-table; margin-left: 10px;"> <tr> <td style="padding: 2px;">Primary</td> <td style="padding: 2px;">Secondary</td> </tr> <tr> <td style="text-align: center; padding: 2px;"><input type="checkbox"/> 1 A</td> <td style="text-align: center; padding: 2px;"><input checked="" type="checkbox"/> 5 A</td> </tr> </table>		Primary	Secondary	<input type="checkbox"/> 1 A	<input checked="" type="checkbox"/> 5 A																															
Modular cable	Terminal X2: 1-2																																									
<input checked="" type="checkbox"/>	<input type="checkbox"/>																																									
Primary	Secondary																																									
<input type="checkbox"/> 1 A	<input checked="" type="checkbox"/> 5 A																																									
I/O unit address: <span style="border: 1px solid black; padding: 2px 10px;">32</span>		Zone: <span style="border: 1px solid black; display: inline-block; width: 60px; height: 15px;"></span>																																								
<b>CURRENT PICK-UP SETTINGS</b>  IL1, IL3 I> ( x In ): _____  IL2/Io I> ( x In ): _____  <b>Switch group settings</b>  <table style="width: 100%;"> <thead> <tr> <th style="text-align: left;">SW1</th> <th style="text-align: left;">Off</th> <th style="text-align: left;">On</th> </tr> </thead> <tbody> <tr> <td>1</td> <td><input type="checkbox"/> Zone 1 L&gt;</td> <td><input checked="" type="checkbox"/> Zone 1 L&gt;</td> </tr> <tr> <td>2</td> <td><input type="checkbox"/> Zone 2 L&gt;</td> <td><input checked="" type="checkbox"/> Zone 2 L&gt;</td> </tr> <tr> <td>3</td> <td><input type="checkbox"/> Zone 3 L&gt;</td> <td><input type="checkbox"/> Zone 3 L&gt;</td> </tr> <tr> <td>4</td> <td><input checked="" type="checkbox"/> Zone 4 L&gt;</td> <td><input type="checkbox"/> Zone 4 L&gt;</td> </tr> <tr> <td>5</td> <td><input type="checkbox"/> Addr 8</td> <td><input checked="" type="checkbox"/> Addr 8</td> </tr> <tr> <td>6</td> <td><input checked="" type="checkbox"/> Addr 4</td> <td><input checked="" type="checkbox"/> Addr 4</td> </tr> <tr> <td>7</td> <td><input checked="" type="checkbox"/> Addr 2</td> <td><input checked="" type="checkbox"/> Addr 2</td> </tr> <tr> <td>8</td> <td><input checked="" type="checkbox"/> Addr 1</td> <td><input checked="" type="checkbox"/> Addr 1</td> </tr> </tbody> </table> <p style="font-size: small;">Note ! Actual address is "32" + switch 5-8 coefficient value</p> <b>SW2</b> <table style="width: 100%;"> <tbody> <tr> <td>1</td> <td><input checked="" type="checkbox"/> No latch</td> <td><input type="checkbox"/> Latch</td> </tr> <tr> <td>2</td> <td><input type="checkbox"/> 1A</td> <td><input checked="" type="checkbox"/> 5A</td> </tr> <tr> <td>3</td> <td><input checked="" type="checkbox"/> No I&gt; out</td> <td><input type="checkbox"/> I&gt; out</td> </tr> <tr> <td>4</td> <td><input checked="" type="checkbox"/> No ext I&gt;</td> <td><input type="checkbox"/> Ext I&gt; in</td> </tr> </tbody> </table>		SW1	Off	On	1	<input type="checkbox"/> Zone 1 L>	<input checked="" type="checkbox"/> Zone 1 L>	2	<input type="checkbox"/> Zone 2 L>	<input checked="" type="checkbox"/> Zone 2 L>	3	<input type="checkbox"/> Zone 3 L>	<input type="checkbox"/> Zone 3 L>	4	<input checked="" type="checkbox"/> Zone 4 L>	<input type="checkbox"/> Zone 4 L>	5	<input type="checkbox"/> Addr 8	<input checked="" type="checkbox"/> Addr 8	6	<input checked="" type="checkbox"/> Addr 4	<input checked="" type="checkbox"/> Addr 4	7	<input checked="" type="checkbox"/> Addr 2	<input checked="" type="checkbox"/> Addr 2	8	<input checked="" type="checkbox"/> Addr 1	<input checked="" type="checkbox"/> Addr 1	1	<input checked="" type="checkbox"/> No latch	<input type="checkbox"/> Latch	2	<input type="checkbox"/> 1A	<input checked="" type="checkbox"/> 5A	3	<input checked="" type="checkbox"/> No I> out	<input type="checkbox"/> I> out	4	<input checked="" type="checkbox"/> No ext I>	<input type="checkbox"/> Ext I> in	<b>TEST VALUES</b>  Pick-up current IL1: _____  Pick-up current IL2 / Io: _____  Pick-up current IL3: _____  <b>OPERATING TIME</b>  Injected current: _____ (2x I>, in all three phases)  <b>Measured time:</b> _____	
SW1	Off	On																																								
1	<input type="checkbox"/> Zone 1 L>	<input checked="" type="checkbox"/> Zone 1 L>																																								
2	<input type="checkbox"/> Zone 2 L>	<input checked="" type="checkbox"/> Zone 2 L>																																								
3	<input type="checkbox"/> Zone 3 L>	<input type="checkbox"/> Zone 3 L>																																								
4	<input checked="" type="checkbox"/> Zone 4 L>	<input type="checkbox"/> Zone 4 L>																																								
5	<input type="checkbox"/> Addr 8	<input checked="" type="checkbox"/> Addr 8																																								
6	<input checked="" type="checkbox"/> Addr 4	<input checked="" type="checkbox"/> Addr 4																																								
7	<input checked="" type="checkbox"/> Addr 2	<input checked="" type="checkbox"/> Addr 2																																								
8	<input checked="" type="checkbox"/> Addr 1	<input checked="" type="checkbox"/> Addr 1																																								
1	<input checked="" type="checkbox"/> No latch	<input type="checkbox"/> Latch																																								
2	<input type="checkbox"/> 1A	<input checked="" type="checkbox"/> 5A																																								
3	<input checked="" type="checkbox"/> No I> out	<input type="checkbox"/> I> out																																								
4	<input checked="" type="checkbox"/> No ext I>	<input type="checkbox"/> Ext I> in																																								
<b>FUNCTIONAL TEST</b>  <table style="width: 100%;"> <tbody> <tr> <td style="width: 20%;">DONE:</td> <td><input checked="" type="checkbox"/> Trips</td> <td><input checked="" type="checkbox"/> Alarms</td> <td><input checked="" type="checkbox"/> Indication</td> <td><input type="checkbox"/> BI/O</td> <td><input type="checkbox"/> Self-supervision</td> </tr> <tr> <td>OK:</td> <td><input checked="" type="checkbox"/> Trips</td> <td><input checked="" type="checkbox"/> Alarms</td> <td><input checked="" type="checkbox"/> Indication</td> <td><input type="checkbox"/> BI/O</td> <td><input type="checkbox"/> Self-supervision</td> </tr> </tbody> </table>				DONE:	<input checked="" type="checkbox"/> Trips	<input checked="" type="checkbox"/> Alarms	<input checked="" type="checkbox"/> Indication	<input type="checkbox"/> BI/O	<input type="checkbox"/> Self-supervision	OK:	<input checked="" type="checkbox"/> Trips	<input checked="" type="checkbox"/> Alarms	<input checked="" type="checkbox"/> Indication	<input type="checkbox"/> BI/O	<input type="checkbox"/> Self-supervision																											
DONE:	<input checked="" type="checkbox"/> Trips	<input checked="" type="checkbox"/> Alarms	<input checked="" type="checkbox"/> Indication	<input type="checkbox"/> BI/O	<input type="checkbox"/> Self-supervision																																					
OK:	<input checked="" type="checkbox"/> Trips	<input checked="" type="checkbox"/> Alarms	<input checked="" type="checkbox"/> Indication	<input type="checkbox"/> BI/O	<input type="checkbox"/> Self-supervision																																					
<b>Remarks</b>																																										
Tested by: _____ Your name		Date: _____ dd.mm.yyyy																																								

Figure 4.2-3 Test report example page 3

## 5. Troubleshooting

### 5.1. Checking the wiring

- Check that the wiring of the trip circuit is not faulty if the trip signal does not reach the circuit breaker.

### 5.2. Checking the trip condition

- Check the configuration if the protection does not trip even when a sufficient light signal is provided. The protection may be configured to require both the light and current condition to trip. In that case, inject also the current.

### 5.3. Checking the I/O unit and arc flash sensor installation

- Check the sensor wiring if the self-supervision detects a faulty sensor. The sensor wire may have loosened in the terminal blocks.
- Check the distance between each end in the communication chain if errors occur in the communication. The total distance between the ends of the communication bus must be less than 100 meters. Lengths exceeding 100 meters can cause interruptions and faults in the communication.
- Check the number of the I/O units if errors occur in the communication. In systems with more than 5 I/O units, it is recommended to have a separate auxiliary power installed for the I/O units. Pay particular attention to the polarity of the cable connections.

**NOTICE**

For more information on the I/O units, see the user manual.

### 5.4. Checking the suitability of the light source

- Check that the light source is powerful enough and gives a long enough pulse. Inadequate light in case of fibre sensors can result in a situation where the main unit registers the arc flash event but does not trip.

## **5.6. Checking the daylight blocking mode**

- Check that the light pulse to the arc flash sensor is not too long. If light is supplied to the arc flash sensor for over three seconds the self-supervision function activates and switches the light sensor channel to daylight blocking mode, the sensor channel is blocked. The sensor channel indication activates and an error message appears on the main unit. Remove the light in order reset the blocked channel..

## 6. Glossary

Term	Description
BI/O	Binary input/output
CBFP	Circuit-breaker failure protection
CT	Current transformer
HMI	Human-machine interface
IED	Intelligent electronic device
LED	Light emitting diode
Local HMI	IED front panel with display and push-buttons
NO	Normally open contact
$U_{AUX}$	Auxiliary voltage
VAMPSET	Configuration tool for VAMP protection devices







## Customers Care Center

<http://www.schneider-electric.com/ccc>

### Schneider Electric

35 rue Joseph Monier  
92506 Rueil-Malmaison  
FRANCE

Phone: +33 (0) 1 41 29 70 00  
Fax: +33 (0) 1 41 29 71 00

[www.schneider-electric.com](http://www.schneider-electric.com)

**Publication version: VARCTEST/EN M/B002**

Publishing: Schneider Electric  
02/2014